PORT-ORFORD-CEDAR RESISTANCE TESTING AND BREEDING: An Update From the Dorena Tree Improvement Center

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The Resistance Screening Continues

Screening. Field selections for the initial phase of screening for resistance to the exotic root pathogen, *Phytophthora lateralis*, have continued over the last year. Most of these selections were from private land, but trees from the Redwood National Park and Castle Crag State Park in Northern California were also evaluated. To date, over 9000 field selections have been made and over 1100 have been chosen for the breeding program. In 2000, Dorena moved into the second phase of screening. Trees are initially selected for resistance from the screening process completed at Oregon State University (OSU) using the stem inoculation technique. These trees are now being retested at OSU using a root inoculation technique to validate and refine the initial screening results. Approximately 10% of the trees from the initial testing were retested in 2000 and another 25% are currently in retesting. All initial selections will be retested, using the root inoculation technique by the end of 2004, budget pending.


Field Selection At Redwood NP


Resistance Screening At OSU


Older Field Planting at Camas Valley, Roseburg BLM

Field Plantings. In cooperation with several federal, state and county agencies, five outplantings were installed in 2001. A long-term demonstration planting was installed on Coos County land with a small subset of that planting on the BLM Roseburg District. These plantings will provide the opportunity to demonstrate, over a long period of time, the survival rate of trees with testing results varying from low to high resistance. In addition, a large planting at OSU and two smaller plantings at the Powers Ranger District and Fish Lake in northern California were planted. These plantings, in heavily infected areas, will be used to field validate greenhouse testing results.

Breeding. Resistance testing of control crosses from initial selections has been underway since 1998. Analyses of the results will provide insights on the inheritance of resistance. Table 1 is an example of a control cross mating design tested in 2000. This design crossed parents whose resistance results from 1989/90 ranged from high to low in the initial testing phase. Their seedling progeny were then tested using the root inoculation technique. Table 1 also demonstrates the use of field outplantings to validate greenhouse results. The same control cross mating design was


Control Crossing at Dorena

planted at a site on the BLM Roseburg District. Notice the low percent mortality from one parent tree in particular, 117490. Also notice there seems to
be a fairly close relationship between mortality in the greenhouse and the field plantings. Although the greenhouse testing is complete, the field planting is still being monitored and further mortality is likely to occur.

Table 1. Percent Mortality Of A Twelve Parent Crossing Design Tested In 2000. Greenhouse (GH) and Field Planting at Camas Valley (CV) Results.

		Male Parent													
		PO-OSU-CF1		PO-OSU-CF2		510049		510008		118569		117344		**Average Percent Mortality**	
		GH[a]	CV[b]	GH	CV	GH	CV	GH	CV	GH	CV	GH	CV	GH	CV
Female Parent	118573			x	x	x	x					x	x	**46**	**38**
	117490			x	x	x[c]	x[c]					x	x	**2**	**28**
	510042	x[c]	x[c]					x[c]	x[c]	x[c]	x[c]	x	x	**78**	**73**
	118562	x[c]	x[c]			x[c]	x[c]	x	x	x[c]	x[c]	x	x	**45**	**65**
	510041	x	x	x	x							x	x	**37**	**63**
	510044	x	x	x	x	x[c]	x[c]			x[c]	x[c]	x	x	**64**	**73**
	Average Percent Mortality	**50**	**51**	**33**	**42**	**43**	**58**	**50**	**69**	**85**	**89**	**42**	**59**		

x = Cross completed
a = Percent Mortality as of 9/15/00
b = Percent Mortality as of 10/24/00
c = reciprocal cross completed

Moving Towards Providing Resistant Seed

Breeding Zones and Studies. Thus far, the screening program has identified a number of genotypes with resistance and we are cautiously optimistic about the potential for developing durable resistance. USFS Geneticists and others have developed breeding zones and work has begun at Dorena to further evaluate the variability of the species to aid in using pathogen resistant stock effectively. Working with BLM and OSU, Dorena has begun two studies that evaluate the response of small trees to the environmental stresses most likely to kill Port-Orford-cedar: drought and frost. Both studies should be completed by 2002. Dorena also provided trees this year to OSU for a resistance mechanism study.

Seed Production. Based on results from the 2000 root dip validation testing, two operational containerized seed orchards were started this year. These two orchards represent the two lower elevation bands (0-1500 feet and 1501-3000 feet) from the North Coastal breeding block (Breeding Block 1). Although the size and number of genotypes in each orchard is small at this point, we anticipate adding more genotypes as more testing and analysis is completed and providing sizable amounts of seed to as early as Fall 2002.

Cones At Dorena

Facilities Tour. In July of 2000, Dorena hosted a tour of our facilities and invited individuals and landowners in California and Oregon who have expressed an interest in growing

Port-Orford-cedar and learning about the disease resistance screening and breeding program. Many non-federal landowners and private individuals attended and expressed an interest in working with the USFS and BLM on the program and obtaining resistant seed. Although our production orchards for federal agencies are not online yet, we were able to sell a small amount of resistant seed from initial testing to the Oregon Department of Forestry this year.

Technical Transfer Work

In the past year, Dorena personnel have attended many conferences, providing posters and presentations on the Port-Orford-cedar resistance testing and breeding program. These conferences included two international meetings, the Western International Forest Disease Work Conference and the Symposium On Durable Resistance, as well as national, regional and local meetings of the Society of American Foresters.

Visitors and Questions Welcome

We would like to encourage anyone who has questions or would like to stop by and see our operations to give us a call at (541) 767-5700 or visit our website at http://www.fs.fed.us/r6/dorena. We look forward to continuing to work with all of you on this cooperative effort in developing the Port-Orford-cedar disease resistance program.

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